

science that might not be "briefly refuted" by such a method; but I think it would be fair to employ the words, "particular opinions of Sir W. Thomson" in place of "principles of natural philosophy," and "imaginary consequences of these opinions" in place of "facts." If this were done, all would admit that Sir W. Thomson's arguments are conclusive demonstrations; granted the premisses, the conclusions certainly follow. But geologists have simply to assume the contrary premisses, and they may mathematically demonstrate the reverse. Agree to beg all the difficulties of a question, and a certain conclusion may easily be obtained. This fact was recognised in the Middle Ages, and Mayer has not got rid of it.

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[The remarks of Prof. Tait are contained in his opening lecture for Session 1869-70, which was sent to us with permission to make what use of it we chose. As the matter of Geological Time had been very fully discussed in this country, we did not insert the portions bearing on it. We believe that the portion which we did insert induced the editor of the *Revue* to apply to the author for the whole MS. As to the queries in the above letter we may note,

1. The Dissipation of Energy is a necessary consequence of the second law of Thermodynamics.

2. If "Mayer categorically denies its universality," so much the worse for his own credit, and for that of "the French Academy and the eminent English and German savants" who support him.

3. It is not for us to say what Sir W. Thomson would, or could not, do.

4. So, after all, Mayer seems to be no better than Sir W. Thomson.—ED.]

In Re Fungi

It may allay the alarm of your correspondent "W. G. S." as to the decay of fungology in England, as far, at least, as one of the cases which he quotes is concerned, to be informed that so careful and critical a student of fungi as Mr. W. G. Smith confirmed the determination referred to, and on the faith of the abnormal specimen, included this rare and very critical species without any hesitation among the Middlesex fungi in the "Middlesex Flora," p. 408. Your correspondent "W. G. S." has missed the point of the paragraph from the *Journal of Botany* which he criticises. The specimens of this fungus collected by Mr. Wooster at Whitehall Gardens have a regular and normally developed pileus, and were in striking contrast to the "abnormal specimens" (W. G. Smith, *l. c.*) from the Goswell Road.

F. L. S.

A Shadow on the Sky

I do not know how common is the phenomenon described by Mrs. Charlotte Hall in *NATURE* of Nov. 9 (p. 25), but her communication leads me to report a much less striking appearance of the same kind, which I witnessed Feb. 20, 1870, in this neighbourhood. I was taking an early walk, and had mounted to the top of a ridge commanding an eastern view, about fifteen minutes after sunrise. The sky was veiled in a dark white. Above me, a little to the south and east, hung a ball of vapour in mid-air, warmed into smoke-colour by the rays of the sun, and yet so dense as to cut off these rays, and cast a rectilinear shadow of dark blue against the white coat of the sky. The shadow was sharply defined, and the whole effect was not unlike the nucleus and tail of a comet. In a few moments the shadow faded out, and, shortly after, the ball itself was dispersed. The moon, in its third quarter, was visible somewhat past the zenith, and surrounded with vapour. Twelve hours later we had a violent rainstorm.

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Coal Measures of Ireland

In the new edition of Jukes's "Manual of Geology," by Prof. Geikie, at page 592, it is stated, on the authority of Mr. E. Hull, that "in Leitrim, Fermanagh, and Tyrone, there are true representatives of the Yoredale series of England." I, however (as also the late Mr. Jukes), contend that no comparison can be drawn between the coal-bearing rocks of Ireland and those of England. Furthermore, as Mr. Hull is unacquainted with these

Irish rocks, having only seen a few isolated patches of them, I protest against his being quoted as an authority on the question, more especially as in the paper to which Mr. Geikie referred, "On the Geology of the Ballycastle Coal Fields, &c.," Mr. Hull states that while in the counties above mentioned there are true coal measures, in the provinces of Leinster and Munster there are none—a statement quite contrary to facts, as all the sections of these rocks in Leinster, Munster, and Connaught are identical, and probably, as suggested by the late Mr. Jukes, were once connected, as the lowest bed of coal occurs everywhere at a nearly equal height above the limestone. Furthermore, the intervening strata are nearly identical, there being a certain thickness of argillaceous beds below, next the limestone, and a mixture of arenaceous and argillaceous beds above.

Naturally it may be expected in all places where a sea gradually became shallow, that limestone would be succeeded by fine argillaceous beds, the latter by shore beds, more or less coarse and arenaceous, and eventually by land beds, such as coal, fire-clay, clunch, and the like.

Similar sequences are not uncommon, both on a large and small scale. On the large scale in the passage rocks from the limestone to the coal-bearing rocks of most countries, and on a small scale in the north of Ireland and in Scotland, where a bed of limestone will be succeeded by a shale, the shale by a sandstone, and the latter by a clay or coal.

If we examine into the thickness of the English and Irish rocks, the difficulty of a comparison is apparent. In the latter country the greatest thickness of the rocks called coal measures never exceeds 3,500 feet, this series of strata including all the rocks above the limestone; whilst in Lancashire, according to Mr. Hull's sections, the Yoredale beds alone exceed 5,000 feet in thickness.

Moreover, if any value is to be attached to palæontological evidence, we find that from the base upwards in the Irish rocks there are fossils which in England are considered to be characteristic of the true coal measures. The latter fact would seem to suggest that while in Ireland the upper part of the limestone was being deposited, in England the millstone grits and Yoredale rocks were accumulating, whilst subsequently, in both countries, true coal measures were deposited; those in Ireland being unfortunately very poor in coal, although containing very similar fossils.

In the northern extremity of Ireland, and in Scotland, the measures are very similar, and in certain places apparently identical, as pointed out years since by Sir R. Griffith. This, therefore, is no new fact, as Messrs. Hull and Geikie would suggest to their readers.

G. HENRY KINAHAN

Recent Changes in Circumpolar Lands

SOME years ago I wrote a paper for the Ethnological Society on some changes of surface affecting Ancient Ethnography. Since this was printed many facts have accumulated. These have led me to a tentative generalisation on the subject, which I should like to have discussed in your pages.

The question of the upheaval and subsidence of different areas of the earth's surface, as it is going on at the present moment, is of very great importance in geology, and yet few subjects have been more neglected. A few facts have been here and there collected; but even the best authorities treat the matter in a jejune fashion. According to them the areas of upheaval and subsidence are scattered over the earth's surface in an irregular manner, without any definite law or rule. I believe that with very slight local exceptions there is a very distinct law which governs the subject.

Putting aside altogether the southern hemisphere for the present, I wish to prove that the area of upheaval is confined to the land bordering the Polar Sea, and to the Polar Sea itself; that it is perfectly continuous all round the earth, and that it is greatest near the Pole, and gradually diminishes until it disappears about the 57th parallel, leading to the conclusion that the focus of upheaval is the Pole itself.

Of course, my observations are entirely confined to what is taking place now, and are not to be confused with the facts of any other period, historical or geological.

Commencing with Scandinavia, we have the remarkable testimony of Pliny, Mela, Solinus, and others, to the fact that Scandinavia was considered by the Roman geographers, whose authorities were bold and expert seamen, to be an archipelago. Ptolemy speaks of the Scandian Islands. The very name Scandinavia is evidence that those who used it looked upon it as an

island. This implies that a great deal of dry land must then have been under water. In 1834 Sir Charles Lyell wrote his Bakerian lecture, in which he brought forward overwhelming evidence to prove that Scandinavia was then being gradually upheaved. Celsius, who wrote in the 17th century, had affirmed it, and calculated the rise at forty inches in a century. In 1807 Von Buch wrote that all the country from Frederickstadt, in Sweden, to Abo, in Finland, and perhaps as far as St. Petersburg, was slowly rising. Other authorities concurred, and lastly Sir Charles Lyell, who had approached the subject as a sceptic, was fully convinced after an exploration of the ground. At Stockholm he found striking proofs of change since the Baltic acquired its present tenants, Testacea found there seventy feet above the sea level being identical with those found in the adjacent sea. At Soderleige, a little farther south, and in a bed ninety feet above the sea level, besides the shells were found several buried vessels, made of wood, and joined with wooden pegs. In another place an iron anchor and nails were found. At Upsala brackish water plants were found in meadows where there are no salt springs; a proof that the sea had only recently retired. At Oreggrund, forty miles to the north, the land had risen five inches and a half since 1820, and at Gefle were low pastures, where the inhabitants' fathers remembered boats and even ships floating. Experienced pilots in the Gulf of Bothnia estimated the fall of the waters at two feet in thirty years. Since Sir Charles Lyell's lecture both the Russians and the Swedes have made experiments all proving the same fact.

To the east of Scandinavia we have Finland, exhibiting all the characteristics of a recently-emerged land. It is a mere congeries of lakes and swamps, separated by moss and sand. The level of the lakes is constantly falling. In 1818 Lake Sovando was suddenly lowered; its waters escaped into Lake Ladoga, and much of its bottom was exposed. Similar traditions about low meadows but recently crossed by boats and ships to those existing in Sweden prevail here also, and there seems good ground for believing that in the days of the Norsemen the White Sea and the Gulf of Finland were joined by a considerable strait. Farther east, again, we have the experience of Murchison and his companions, who found on the banks of the Dwina and Vaga recent shells still retaining their colour, and of the same species as those found in the Arctic Sea. In Spitzbergen, Mr. Lamont reports (see vol. xviii. of the "Quarterly Journal of the Geographical Society") that he discovered recent bones and drift wood several miles inland and high above high-water mark, skeletons of whales thirty to forty feet above the sea level. The seal fishers told him the land was rising, and that the seas thereabouts were now too shallow for the right whale, which had forsaken the Spitzbergen coast. This is confirmed by Malmgren (see Petermann's *Mittheilungen*, 2, 1863). Farther east we have the Tundras between the Karen Sea and the Gulf of the Obi presenting bare desolate flats that look as if they had only recently emerged. Middendorf describes the surface of the great Siberian Tundra as coated with fine sand like that now being deposited by the Polar Sea. Von Wrangel has many useful remarks to prove my position. He tells us that Diomed Island, mentioned by Laptev and Schalaurov, is now joined to the mainland; the coast of the Swatoi Ness, which they describe as very indented and ruinous, is now straight. The Bear Islands are mere heaps of ice and stones, evidently but recently covered with water; and shoals and banks now occupy what was tolerably deep water in 1787 when Captain Sarypchev was there.

Herdénstrom, in 1810, found large birches scattered about the Tundra, 3° to the north of any known Siberian forest; probably drift wood such as Wrangel himself found drifting in the Polar Sea. Whales have now almost deserted the Siberian shores, where in the eighteenth century they were common. This is, no doubt, due to the shallowing of the water, as is the case in the Spitzbergen Sea. The shores of the Polar Sea, from the Lena to Behring's Straits, are for the most part low and flat. In winter it is hard to say where land ends and sea begins. A few verst inland, however, a line of high ground runs parallel with the present coast, and formerly, no doubt, constituted the boundary of the ocean. This belief is strengthened by the quantity of drift wood found in the Upper Level, and also by the shoals that run out, and will, no doubt, become dry land (*Vide* Wrangel's Introduction). "At several places along the coast we found old weathered drift wood at the height of two fathoms above the present level of the sea, whilst the lower drift wood lay at a level, indicating a change of level." Moving farther east again across Behring's Straits, we find Captain Beechey describing the coast as a high cliff, now separated from the sea by low flats with

bones, &c., on them. I cannot speak with the same confidence of the vast archipelago that bounds America on the north, nor about the northern shores of America, my researches having been confined to Asia, but evidence must abound in the Arctic voyages. Drift wood and bones of whales are mentioned on high ground by several of them. If it be permitted to quote the works of M. Reclus as an authority, and I believe it to be a most sound book, he says, page 628, numerous indications of the phenomenon (*i.e.* of the upheaval of the circumpolar land of North America) have been recognised in the Arctic islands, scattered off the coasts of the Continent. At Port Kennedy Mr. Walker found shells of the present period at a height of 557 feet above the sea; a bone of a whale lay at a height of 164 feet. Again, page 651, after saying that Southern Greenland is being depressed, he continues, "On the north of Greenland, from lat. 76°, and in Grennell's land, &c., the directly contrary phenomenon is taking place." Hayes discovered on all the coasts the existence of ancient sea-beaches which had gradually risen to the height of 100 feet.

I have thus shown good ground for entertaining the notion that the land at present rising about the Pole is a continuous area, and is not rising merely in detached masses as M. Reclus's and Mr. Murray's maps (*Geographical Distribution of Mammals*) would lead us to suppose. I believe, further, that this area, bounded on the south by about the 57th parallel of latitude, is the only area in the Northern Hemisphere which is at present undergoing upheaval. I should feel grateful to any of your correspondents who would point out where there is another area (of course excepting local disturbance immediately round a volcano); or would direct me to any authorities throwing light on the question I have advanced, which for anything I know may be an old theory, or even an exploded heresy.

Not only is the land around the Pole rising, but there is evidence to show that the nearer we get to the Pole the more rapid the rise is. This has been shown most clearly in the case of Scandinavia by Sir Charles Lyell, who most carefully gauged the rise at different latitudes from Scania, where the land is almost stationary, to the northern parts of Norway, where the rise is four feet in a century. While in Spitzbergen and the Polar Sea of Siberia, if in the memory of seal fishers and others the water has shallowed so fast as to have excluded the right whale, we may presume that the rate of emergence continues to increase, until it reaches its focus at the Pole, as it certainly diminishes until it disappears towards the south between the 56th and 58th parallels of latitude. The subject is one of paramount importance to those who are trying to work out the history of the earth, and I once suggested at the British Association that it should be made the work of a special report, but I was snubbed. I appeal with more confidence to you, sir, to help me to ventilate it. The question of the subsidence of other areas, and of the correlated climatic change, I will reserve for another letter.

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THE ENGLISH GOVERNMENT ECLIPSE EXPEDITION

MANY of the readers of NATURE are no doubt interested in the fate of the Eclipse Expedition of 1871. I will therefore give a sketch of their doings to the present time.

The P. and O. steamer *Mirzapore*, having the party on board, left Southampton on Oct. 26, and, after a rather rough voyage, reached Malta on Nov. 4; left again the same evening, and arrived at Port Said on the 8th; entered the Canal at once, and anchored at Suez on the 10th. Here she remained till the 12th, awaiting the arrival of the Brindisi mails; then left for Galle, where she arrived the 27th. On leaving the Channel a strong S.W. breeze was encountered, which soon increased to half a gale. The ship, though a roller, is a good sea boat, and made good progress; but the bad weather continued with little abatement until the *Mirzapore* was well in the Mediterranean, and nearing Malta. The sea then became calmer, the sun shone out, and the passengers, many of